ADS-SystemVue Linkages

Uniting System, Baseband, and RF design flows for leading-edge designs

Superior RF models and simulators

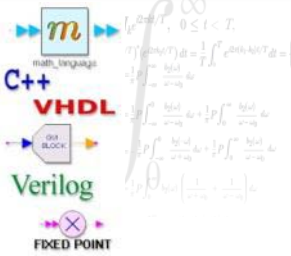
Convenient, polymorphic algorithmic modeling, debug, and test

May 2010

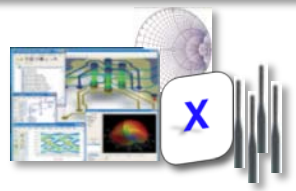
SystemVue – The shortest path from imagination to hardware for communications & defense

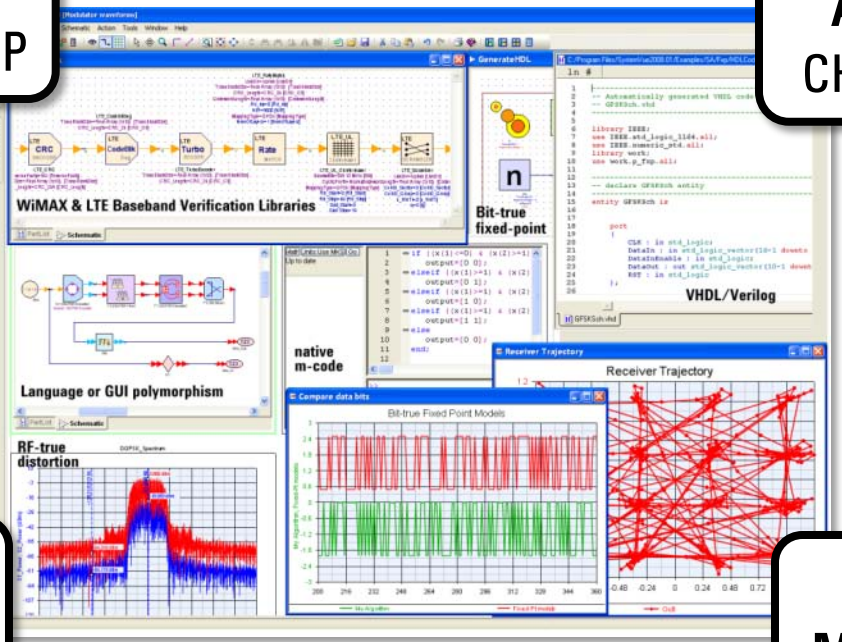
Easily assemble Virtual PHYs

BASEBAND
ALGORITHMS & IP



ACCURATE RF &
CHANNEL EFFECTS





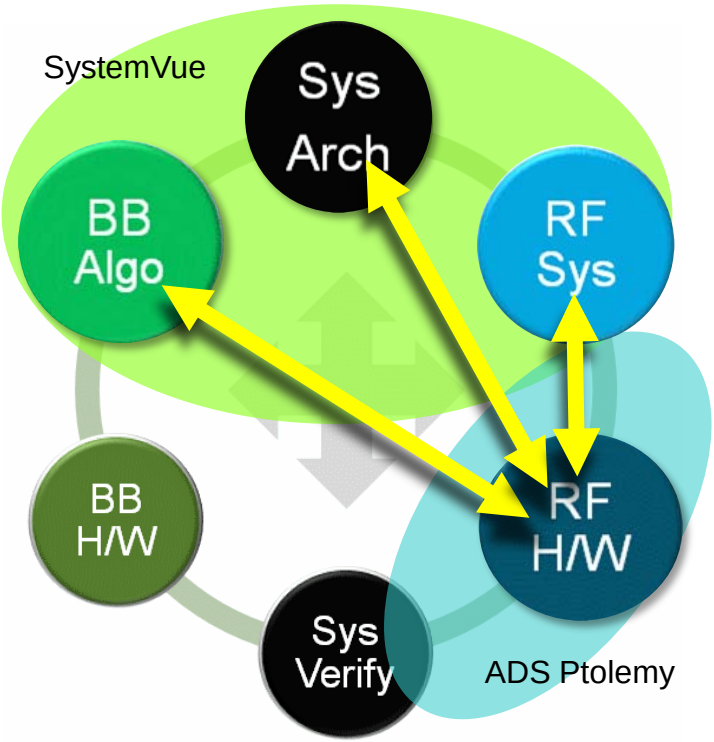
REFERENCE
IP & APPS

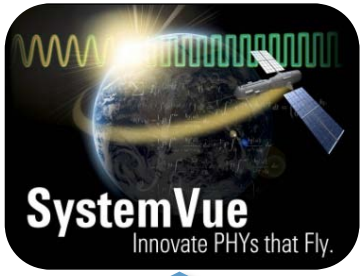
WiMAX
DVB-S2
ZigBee
OFDM
DPD
RADAR
MIMO Channel
mmWave WPAN

Quickly move Ideas to proven, real-world Hardware

HARDWARE &
MEASUREMENTS

Connecting RF with System/Baseband DSP design





SystemVue focuses on RF/BB **architecture & co-partitioning** before anything has been implemented, for the benefit of System & BB designers needing deeper insights into RF and hardware/measurement domains

Also follows through into Verification.

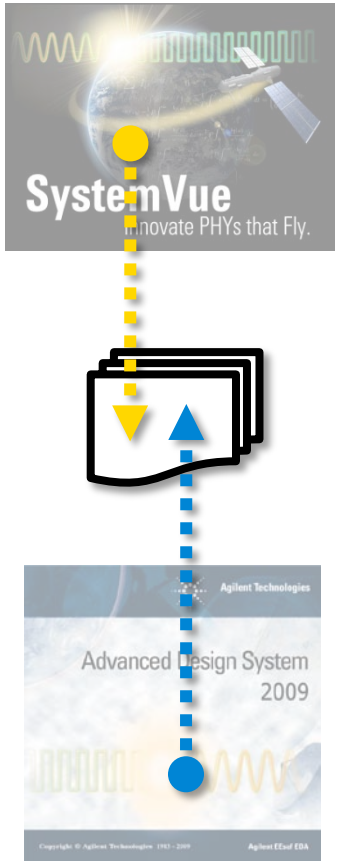
ADS Ptolemy focuses on RF/BB **integration & co-verification**, typically after the DSP is finished, for the benefit of RF designers needing realistic operating scenarios.

Also provides some RF System Analysis.

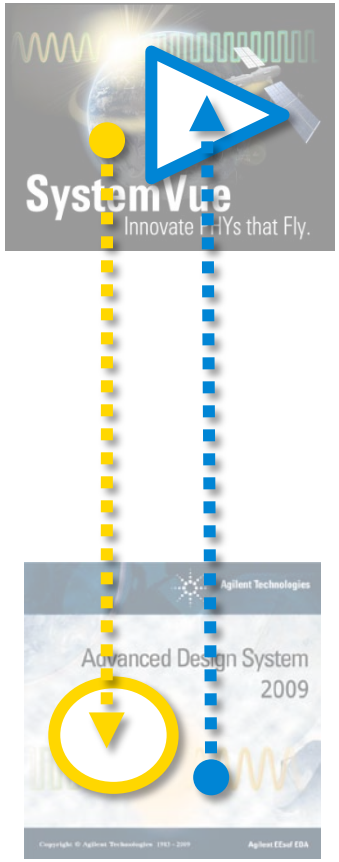
Only Agilent provides world-class leadership positions in simulation, test, and reference IP that crosses these boundaries to deliver a superior ESL-driven design flow for Wireless & Defense

3 Major Ways to Link SystemVue and ADS

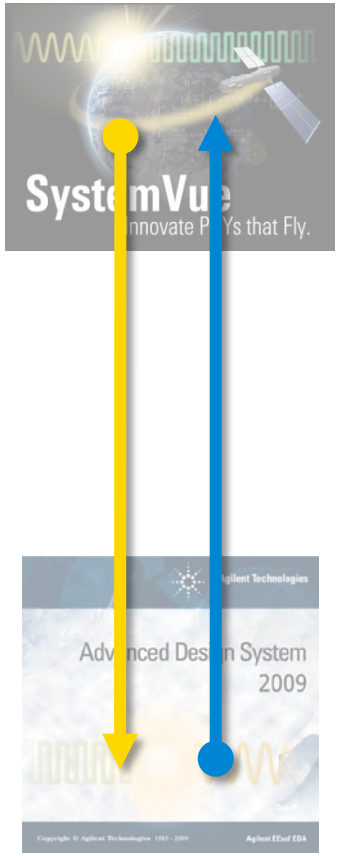
STATIC WAVEFORMS



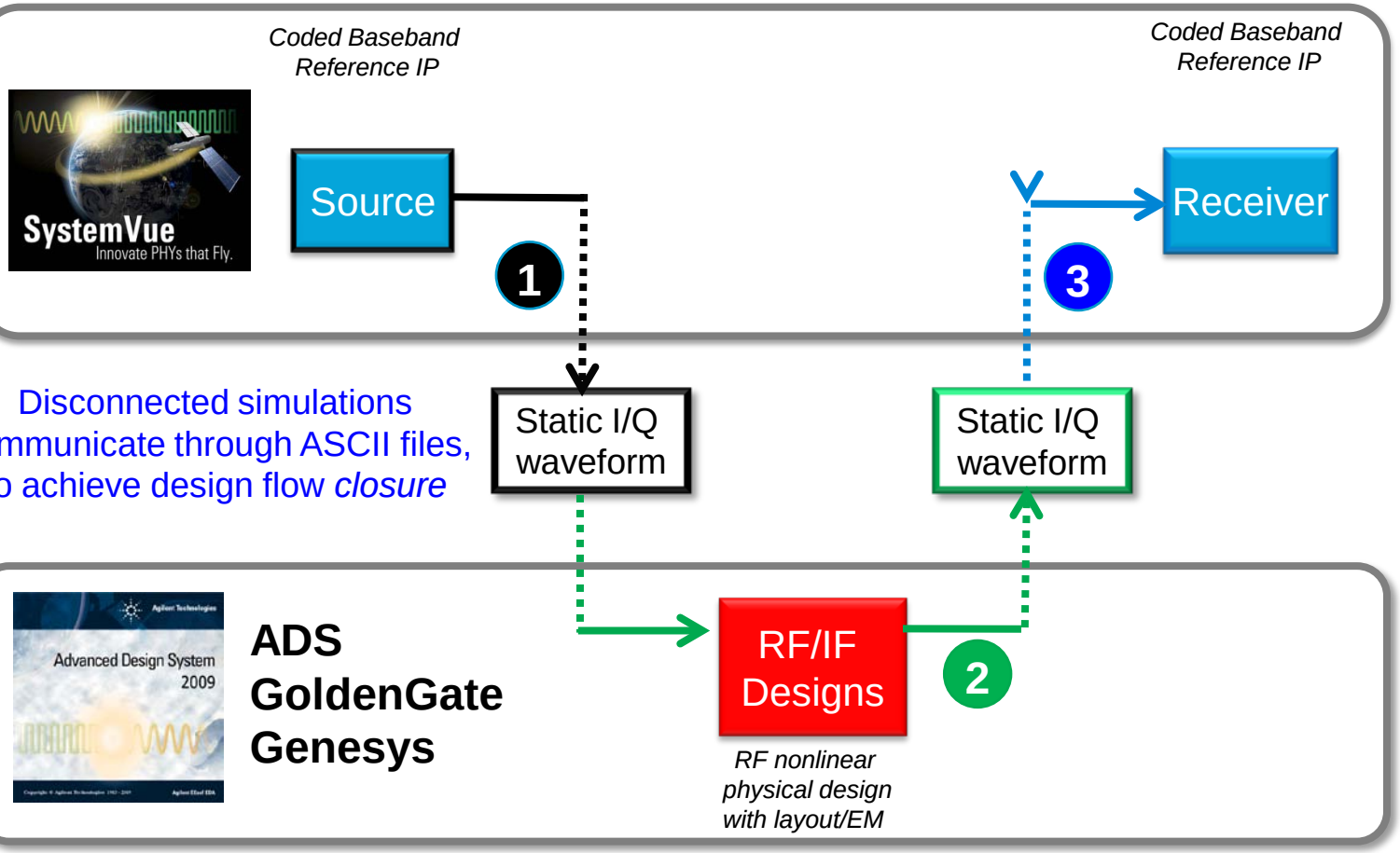
ACTIVE MODELS



LIVE CO-SIM

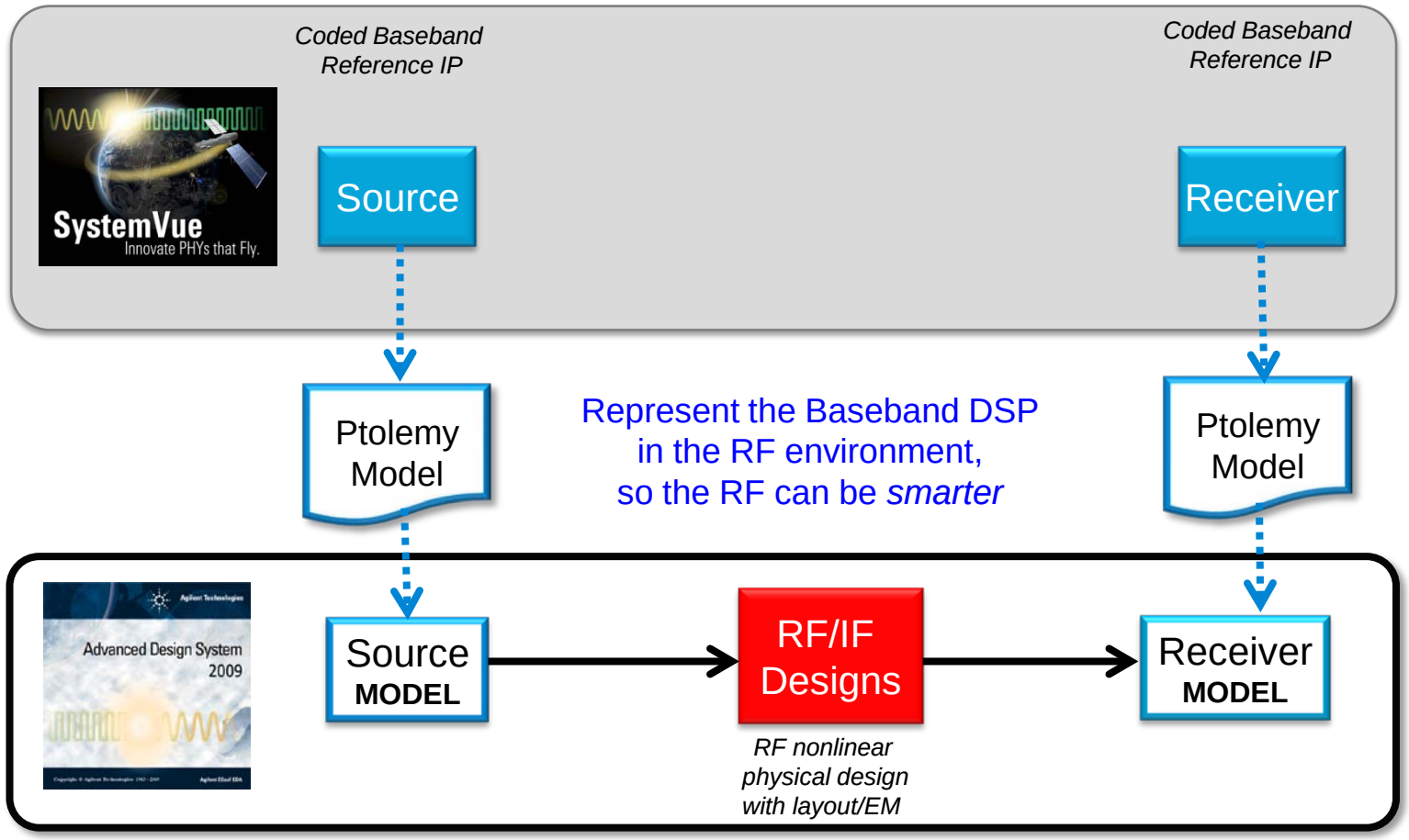


1. Static waveforms



WHO USES : All designers, on virtually any platform
WHEN TO USE : physical separation of designers, tools, licenses, intellectual property, etc

2. Export model to ADS



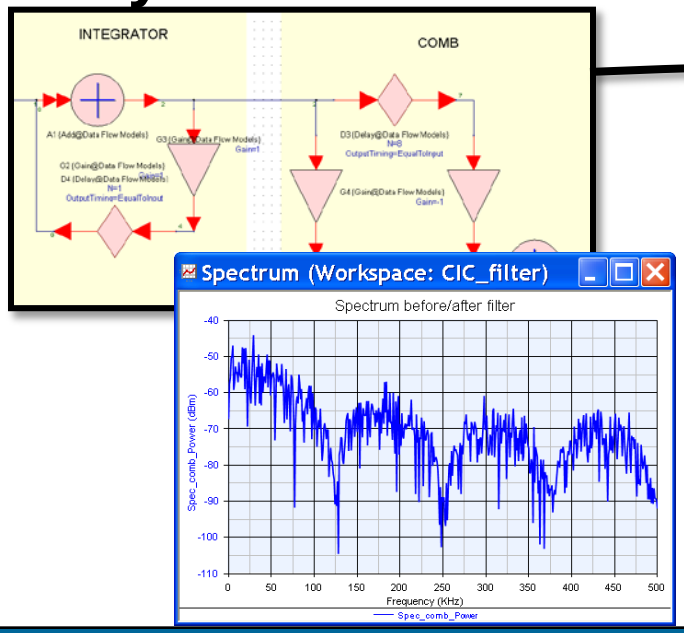
WHO USES : RF circuit designer does the simulating

WHEN TO USE : Diagnoses & solves RF problems directly in his native RF environment

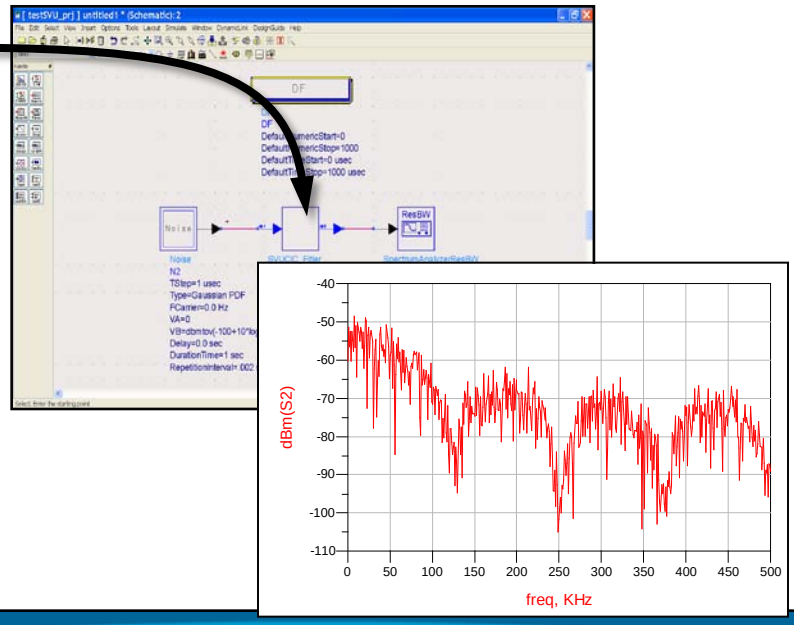
2. Export model to ADS

- Uses new C++ code generation export to ADS
- SystemVue baseband model becomes new ADS Ptolemy primitive
- Provides format-true stimulus/response waveforms for RF verification
- Diagnose system-level effects and fix RF problems in the RF environment

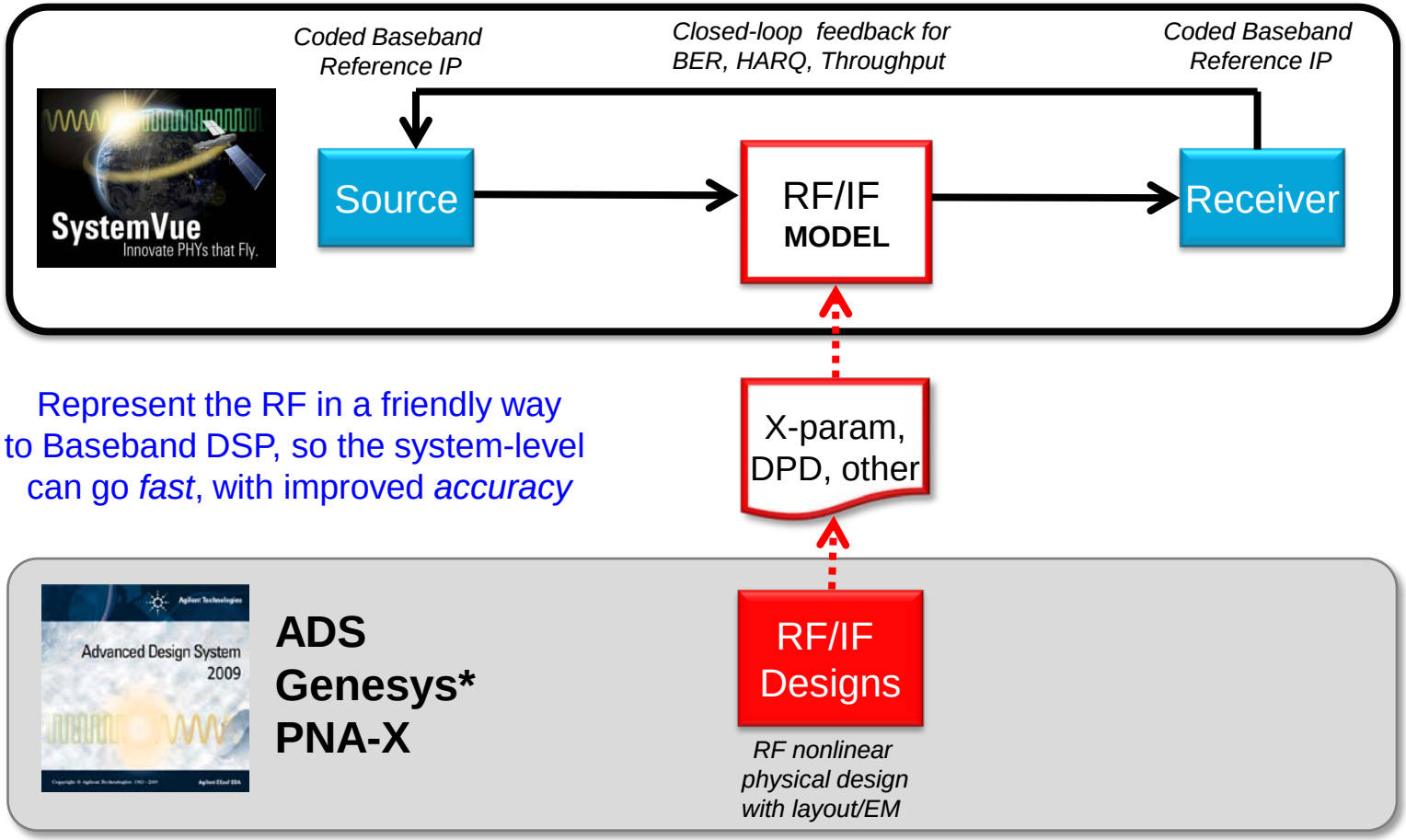
SystemVue 2010



ADS 2009 U1



2. Export a model to SV



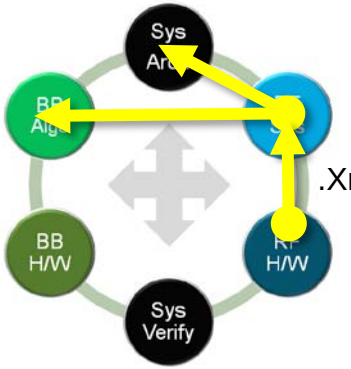
WHO USES : System designer, Baseband algorithm developer
WHEN TO USE : Diagnoses & verifies system performance directly in the ESL environment. Simulation speed is critical to do BER/Throughput studies, and to debug/test algorithms/HW

Agilent EDA Platform support for X-parameters

X-parameter Generation/ Extraction
(LICENSED)

X-parameter
(Sim-based extraction)
ADS 2009 U1
Oct 2009

NVNA
(Meas-based extraction)



X-parameter File

Runtime X-parameter Usage
(NOT LICENSED)

Harmonic Balance
Circuit Envelope
Feb 2009

SystemVue
SV2010.01

W1719 RF System
Design Kit
Mar 2010

NEW

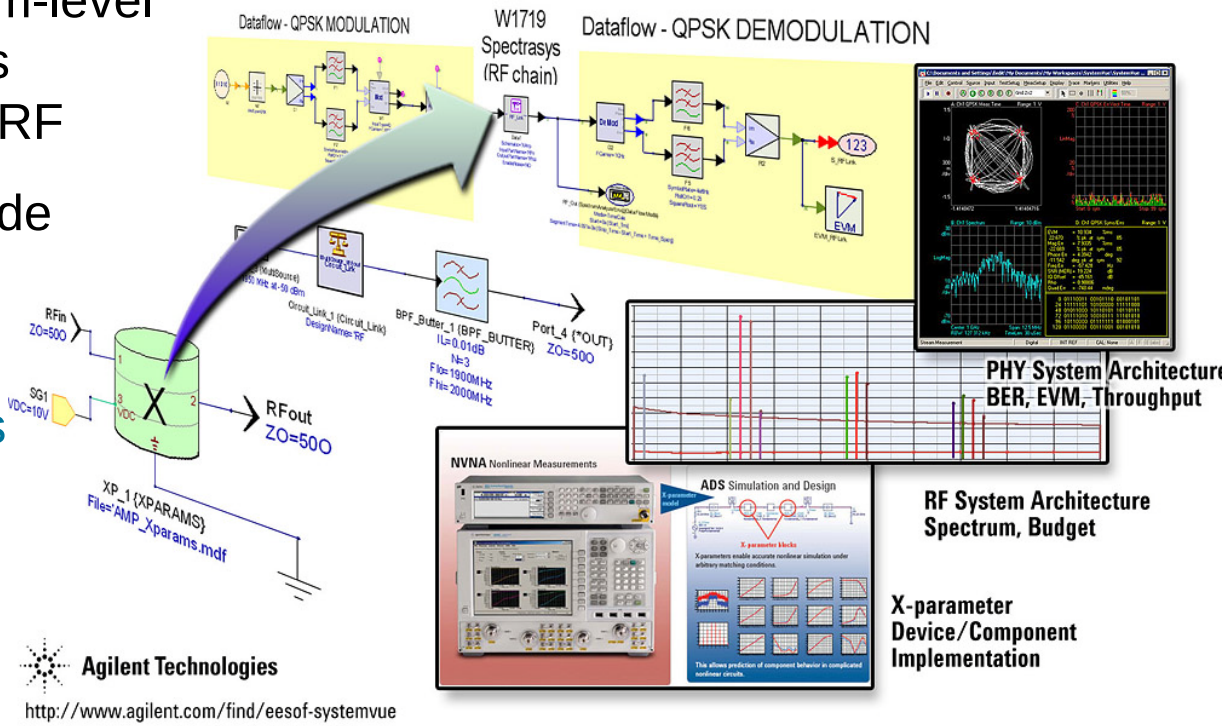
- Virtual Platforms (S/W apps development)
- DSP/FPGA (H/W implementations)
- Digital Pre-Distortion
- RF-BB Partitioning

W1718 C++ Code Generator
W1716 DPD Builder

SystemVue X-parameter import

Brings finished RF designs back up to the architecture level

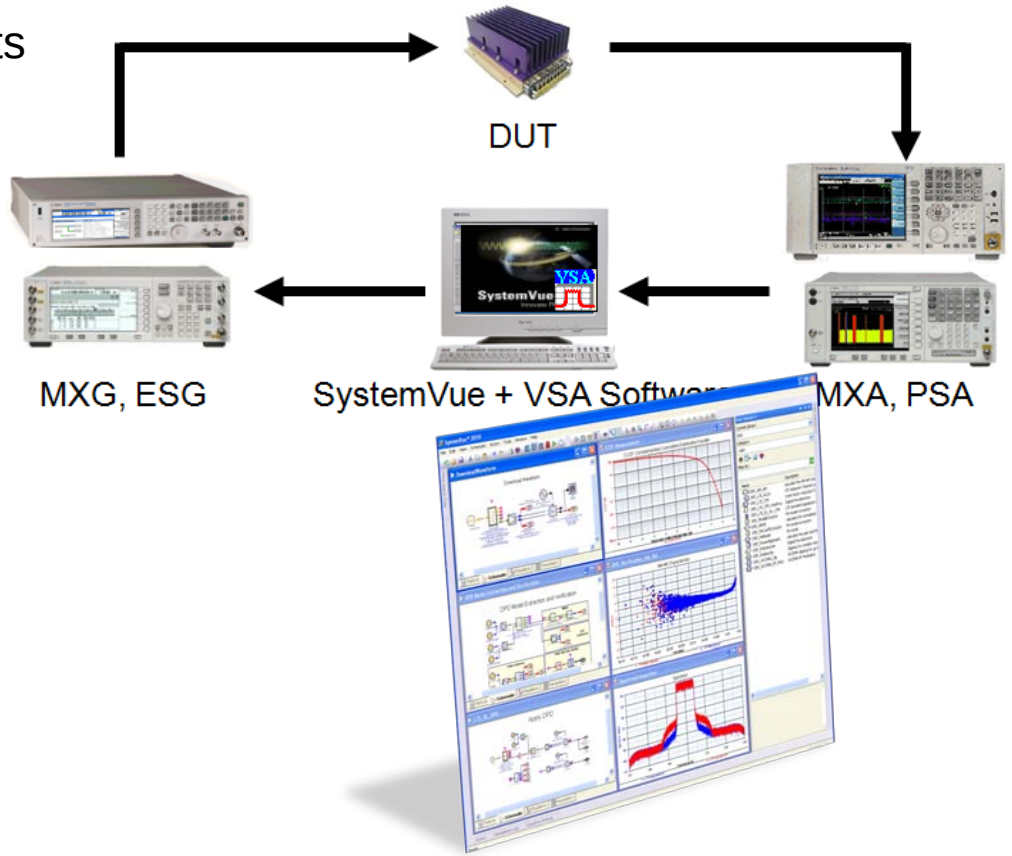
- Directly usable by System-level and Baseband designers who don't need to know RF
- Exchangeable with outside vendors, or internal departments
- Stop using spreadsheets and math equivalents, and re-use your real design files and measurements, directly.



SystemVue DPD model extraction from real RF

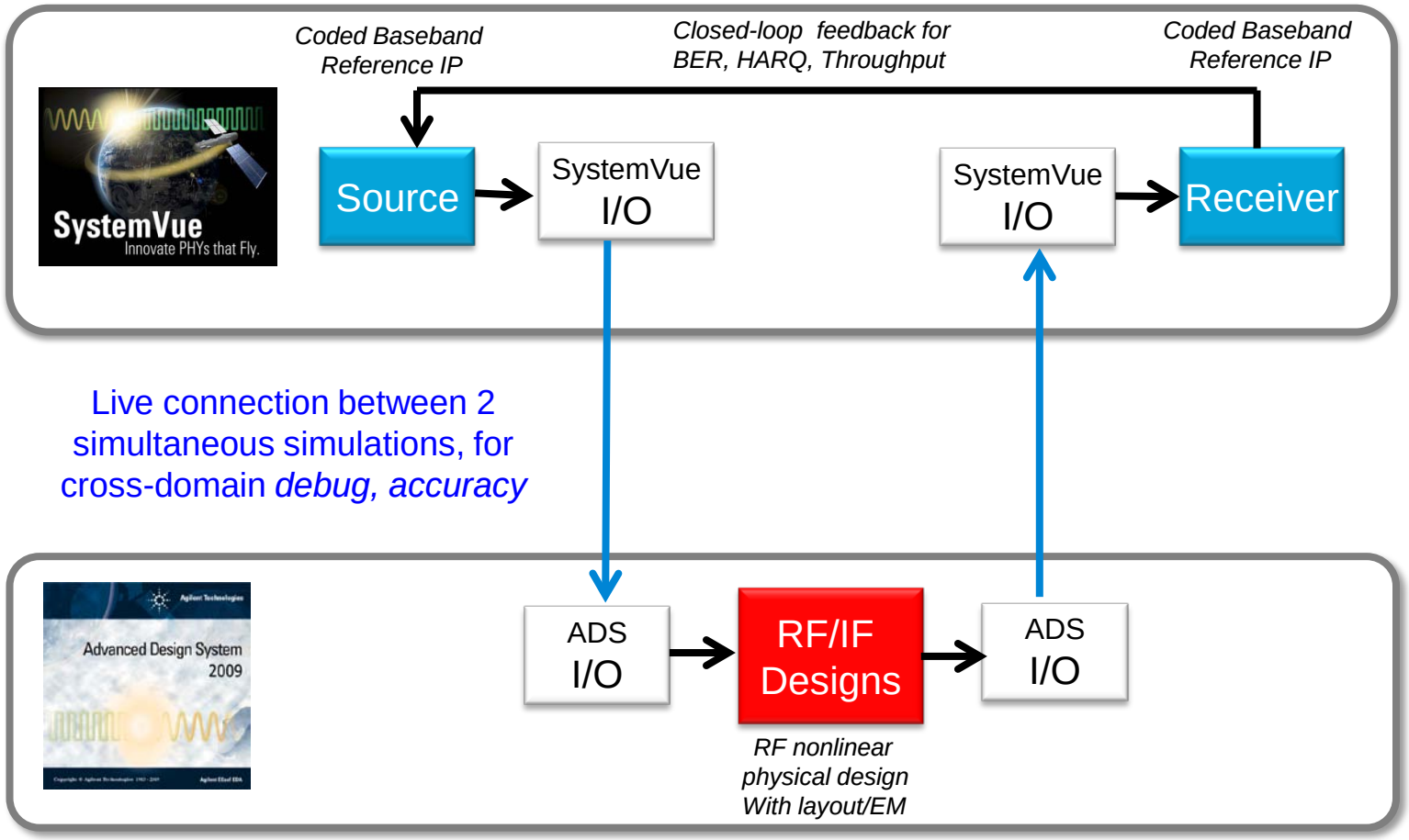
Represent high-power PA's with memory effects

- Agilent W1716 DPD directly extracts a memory polynomial model and DPD correction network using real 4G signals
- Based on direct measurements, or from simulation
- Extremely fast Dataflow simulation for BER and Throughput studies
- Less general than X-parameters (narrow range of signals, BW, carrier frequency, power levels)



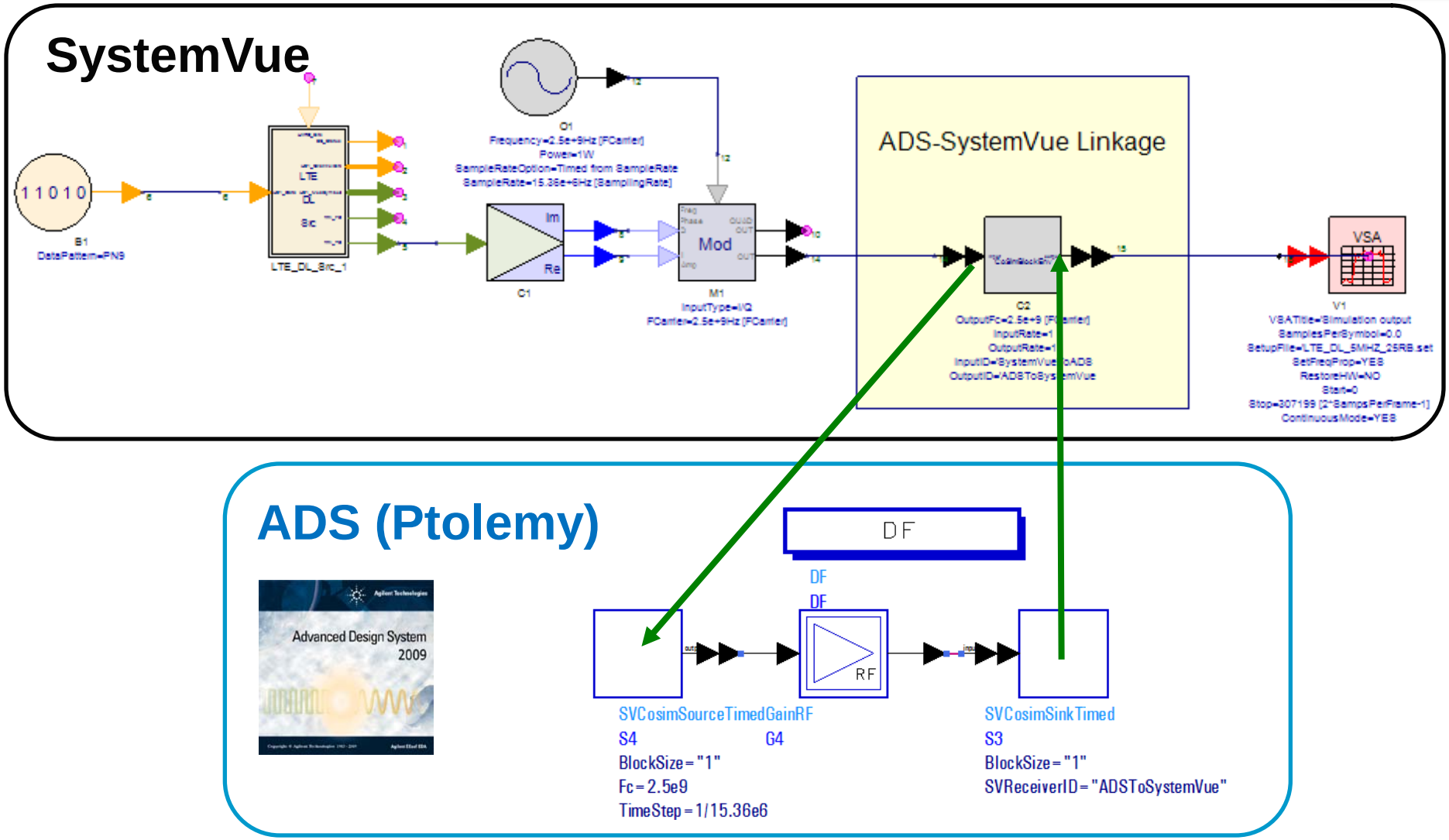
PA designers can re-join the mainstream enterprise design flow!

3. SystemVue-ADS co-simulation

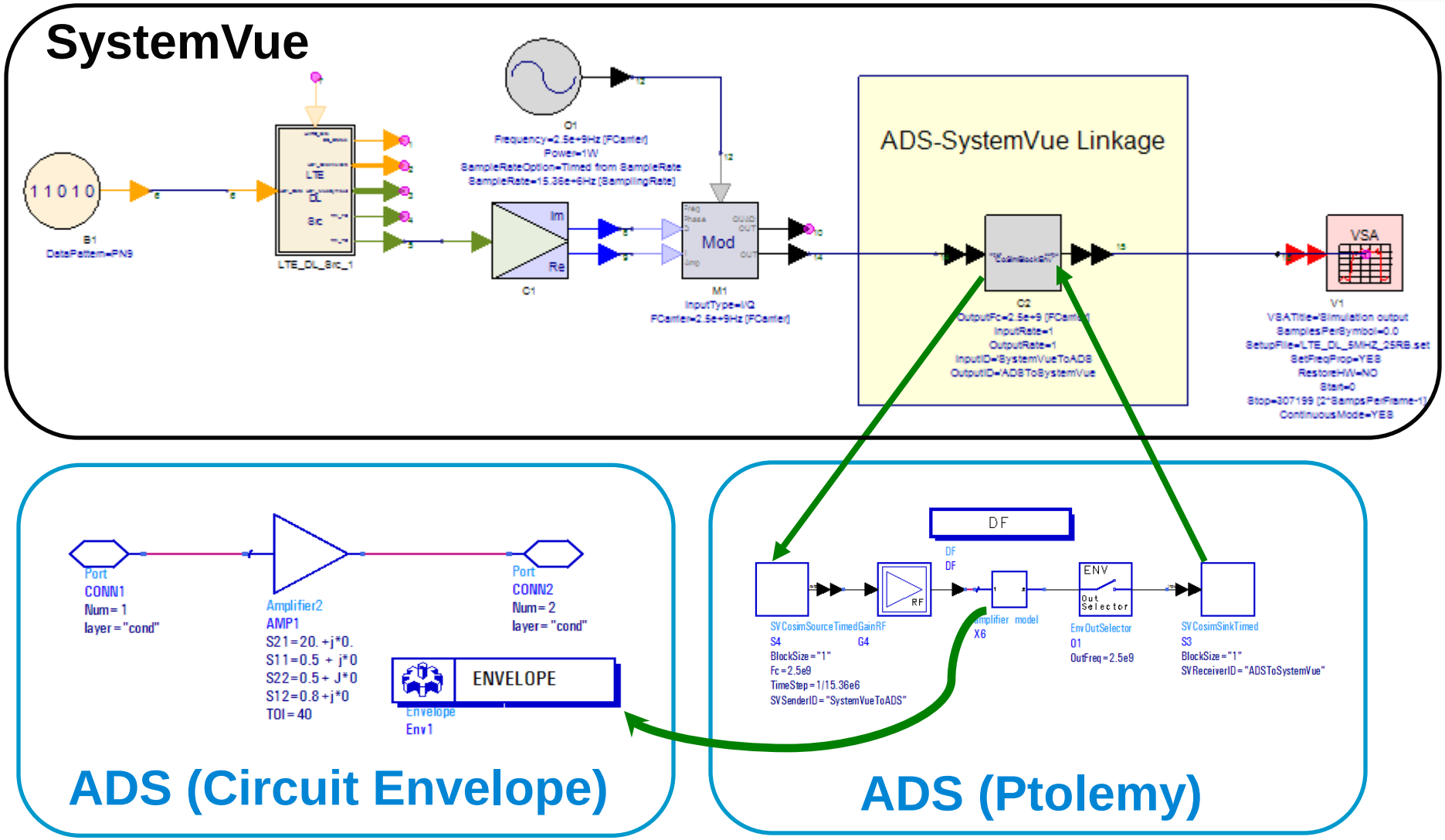


WHO USES : System Architect, Baseband Algorithm, or RF component designers
WHEN TO USE : Full dynamic behavior, with feedback and full accuracy (but slowest option)

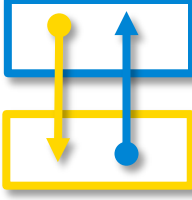
3. SystemVue-ADS co-simulation linkage



3. SystemVue→ ADS*(Ptolemy)*→ ADS*(Circuit)*



3. SystemVue-ADS co-simulation linkage



Allows use of best-in-class tools for RF and DSP domains

Enables direct use and debug of “work-in-progress”

- cross-domain troubleshooting
- interactions between Algorithms, Math, C++, Fixed-point/HDL, RF, Test

Highest accuracy (w/memory effects, dynamic behaviors, EM)

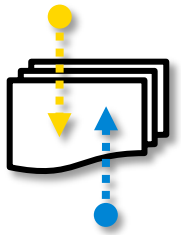
- Behavioral modeling is >> faster, but direct co-sim is most accurate

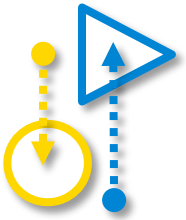
Direct re-use of all RF and Baseband IP without the use of translators, behavioral modeling, exporters *(confidence)*

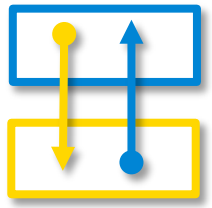
Supported customers can download files from Agilent EEsof Knowledge Center
http://edocs.soco.agilent.com/x/YoFvBg

Summary: 3 Major Ways to Link SystemVue & ADS

	Connectivity	Advantages	Disadvantages
1	**Static Waveform Files**	• Overcome physical separation • Any tools can work • High license availability	• Manual integration • Limited capability • Does not track design changes • Typically left to final test
2	**Active Targeted Model Export**	• Fastest speed • Ease of use • Transportability (library) • IP protection	• Model limitations • Task-specific
3	**Live, Mutual co-simulation**	• Highest accuracy • No loss of functionality • Cross-domain debug • Impromptu checking	• High resource usage • Slow; requires human • IP exposed • No versioning/archive







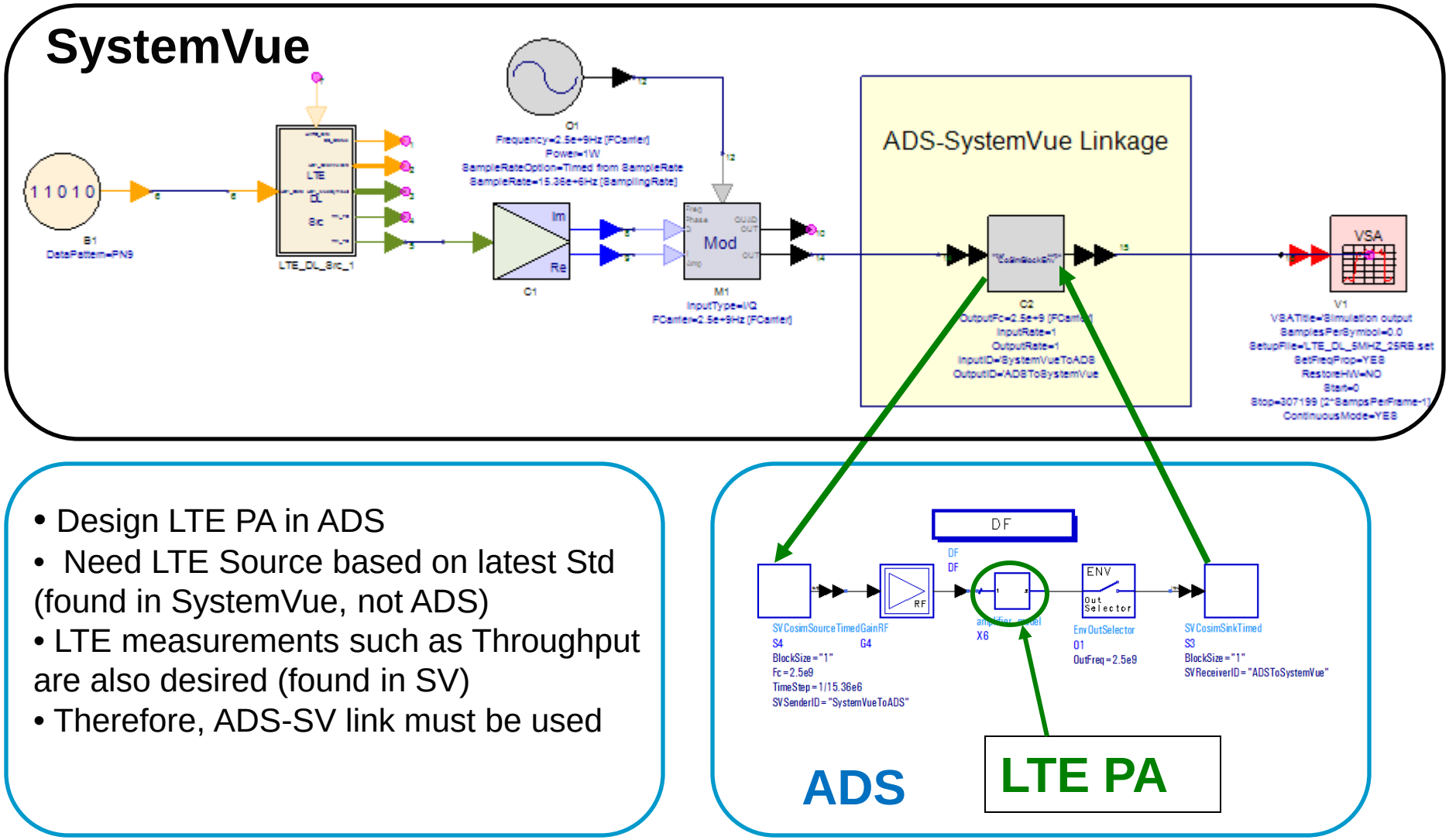
Additional examples of co-simulation

3GPP LTE, release 8.9.0 (Dec 2009)

60GHz Millimeter Wave WPAN (802.15.3c)

Zigbee 802.15.4

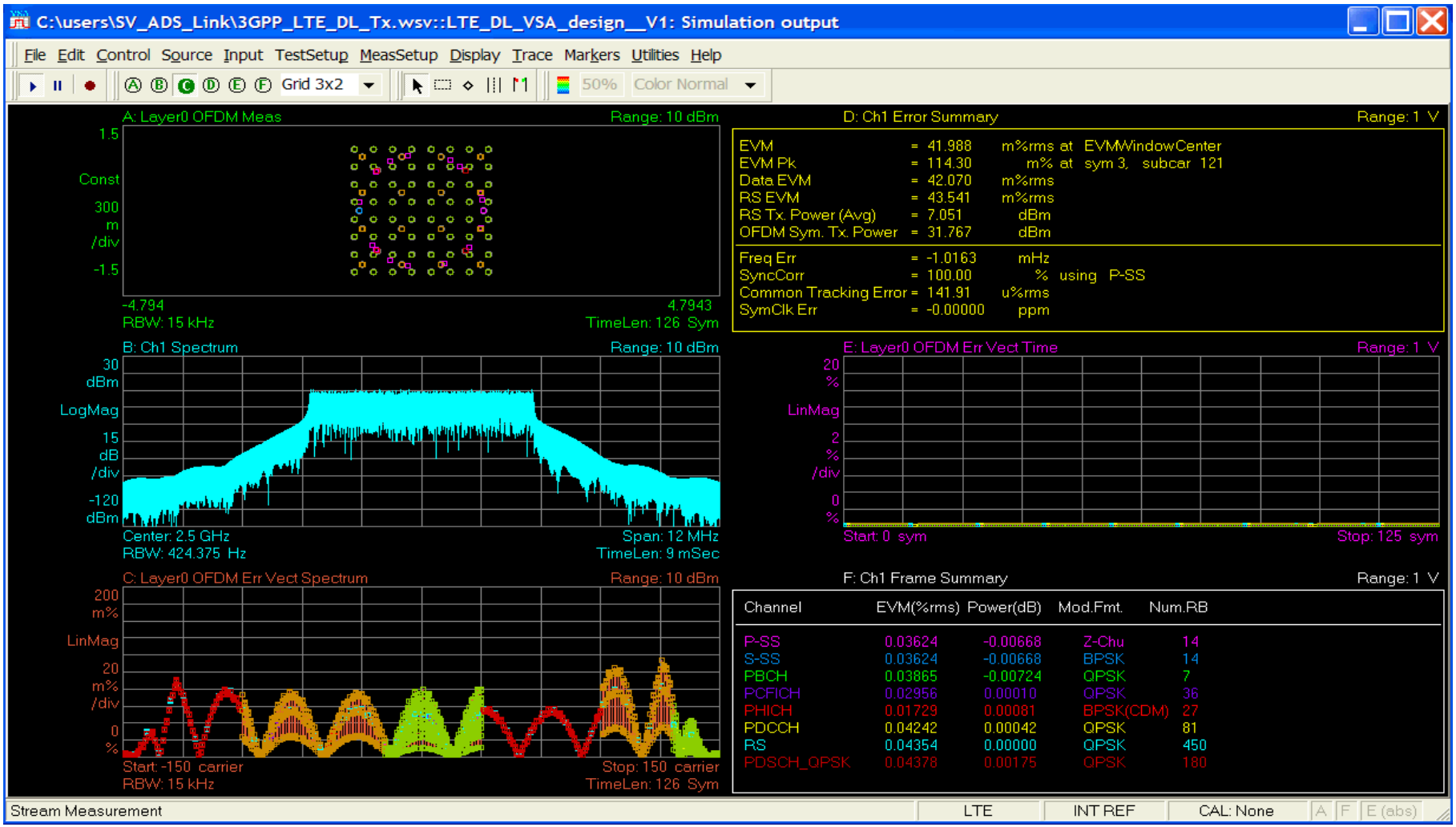
Example – PA design for LTE (Version 8.9)



- Design LTE PA in ADS
- Need LTE Source based on latest Std (found in SystemVue, not ADS)
- LTE measurements such as Throughput are also desired (found in SV)
- Therefore, ADS-SV link must be used

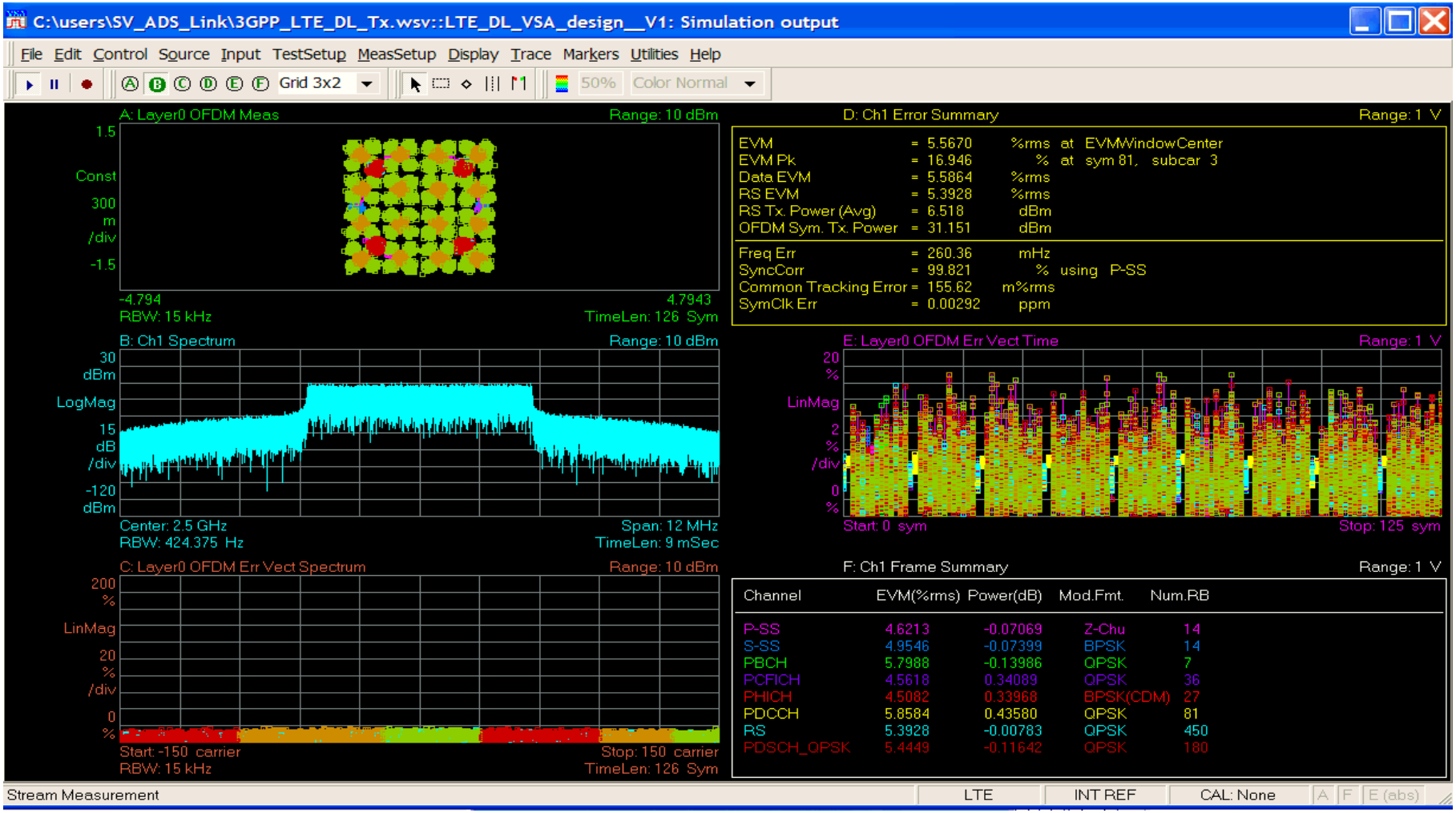
LTE System Test Results

LTE DL Signal with a linear power amplifier (TOI= high)



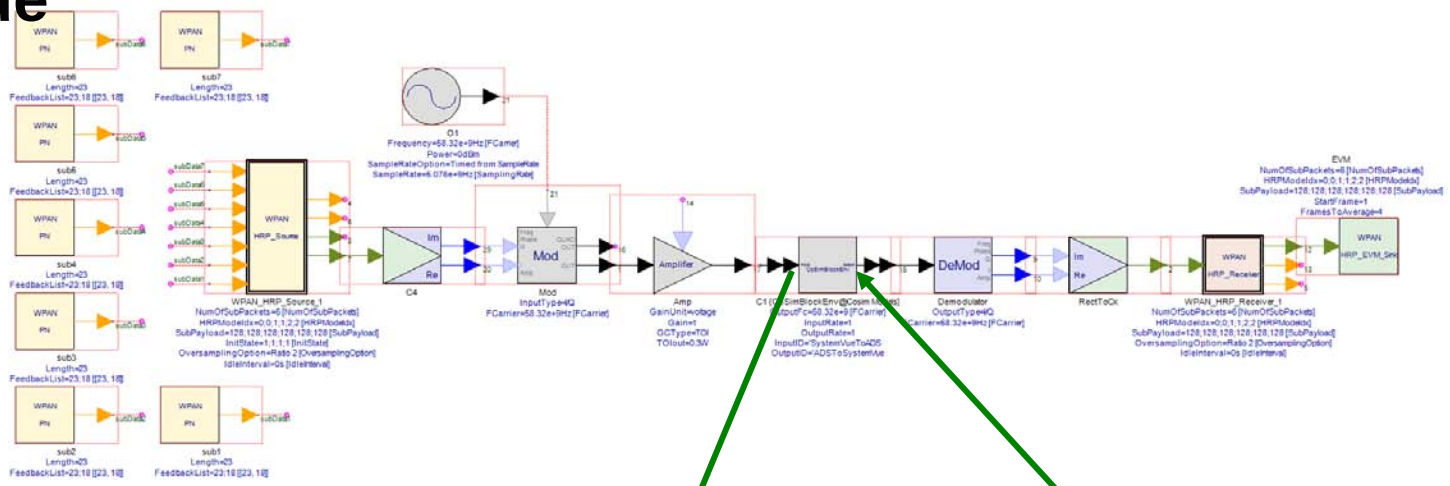
LTE System Test Results

LTE DL Signal with a non-linear power amplifier (TOI=40)

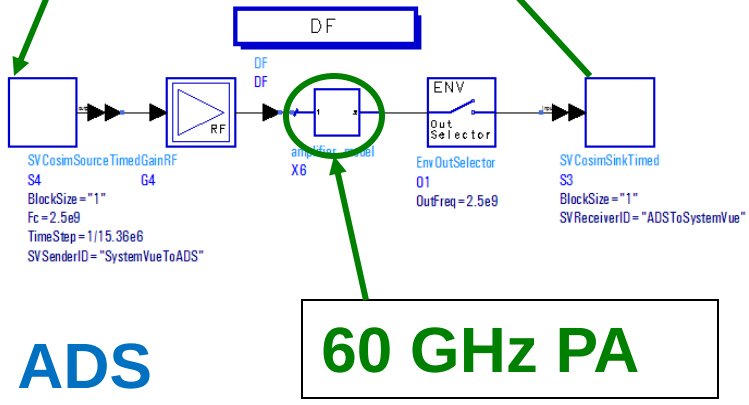


Example – WPAN 60 GHz

SystemVue

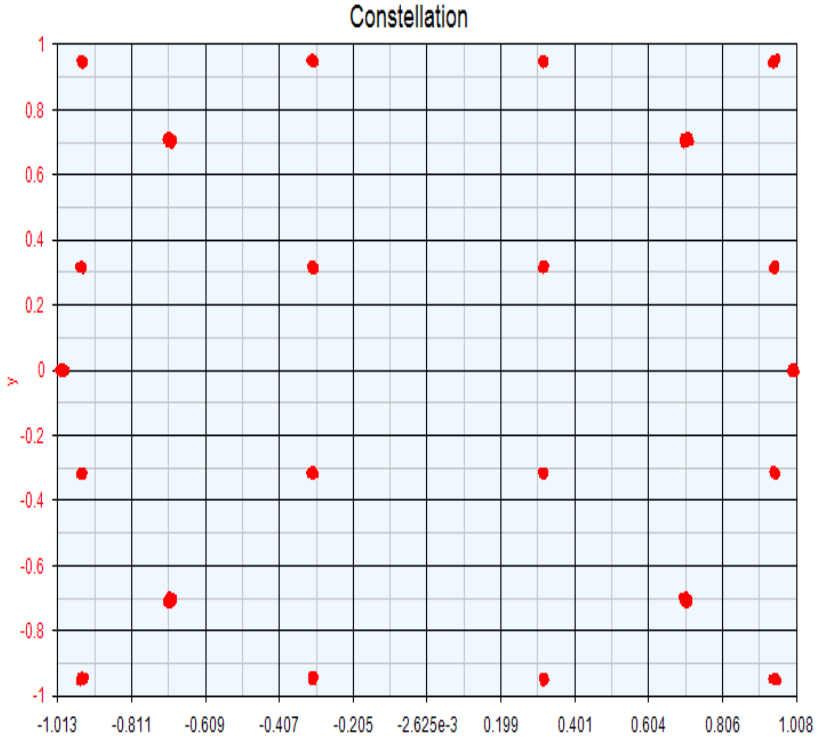


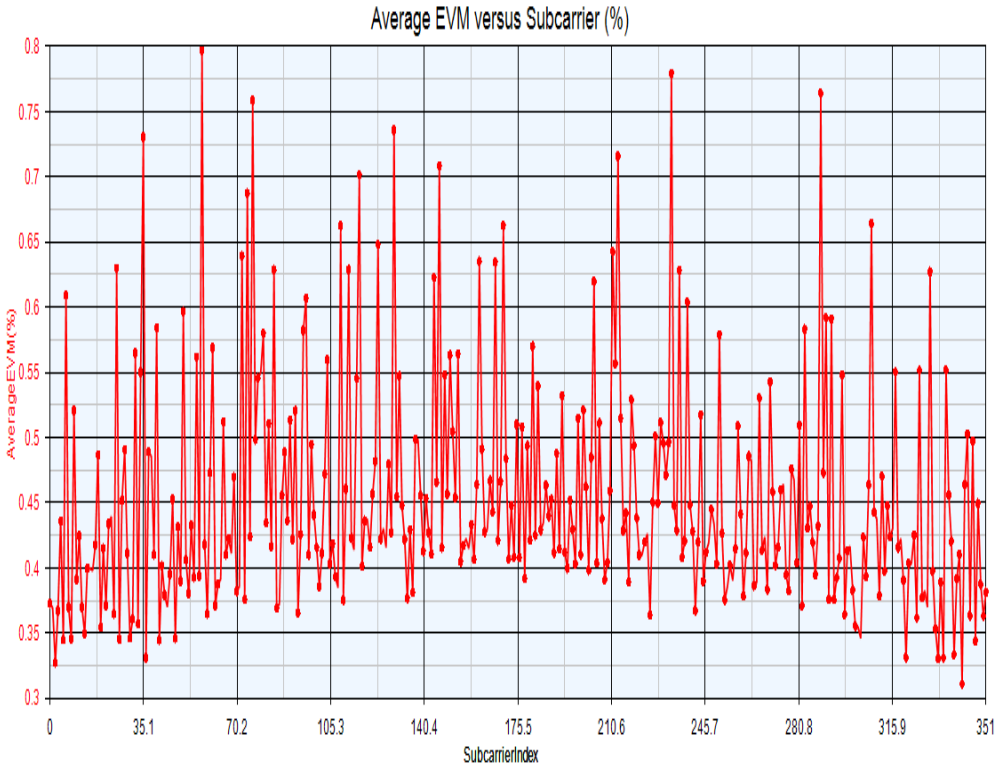
- Design 60 GHz PA in ADS
- Need Wireless HD/WPAN Source that is not found in ADS, but in SV
- Measurements for 60 GHz are also needed from SV
- ADS-SV link must be used



WPAN System Test Results

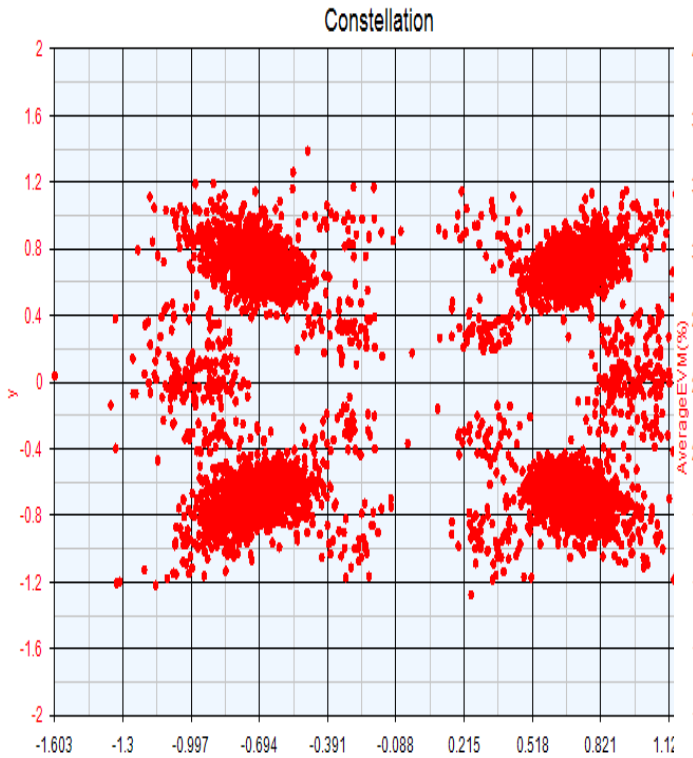
DUT – Linear PA

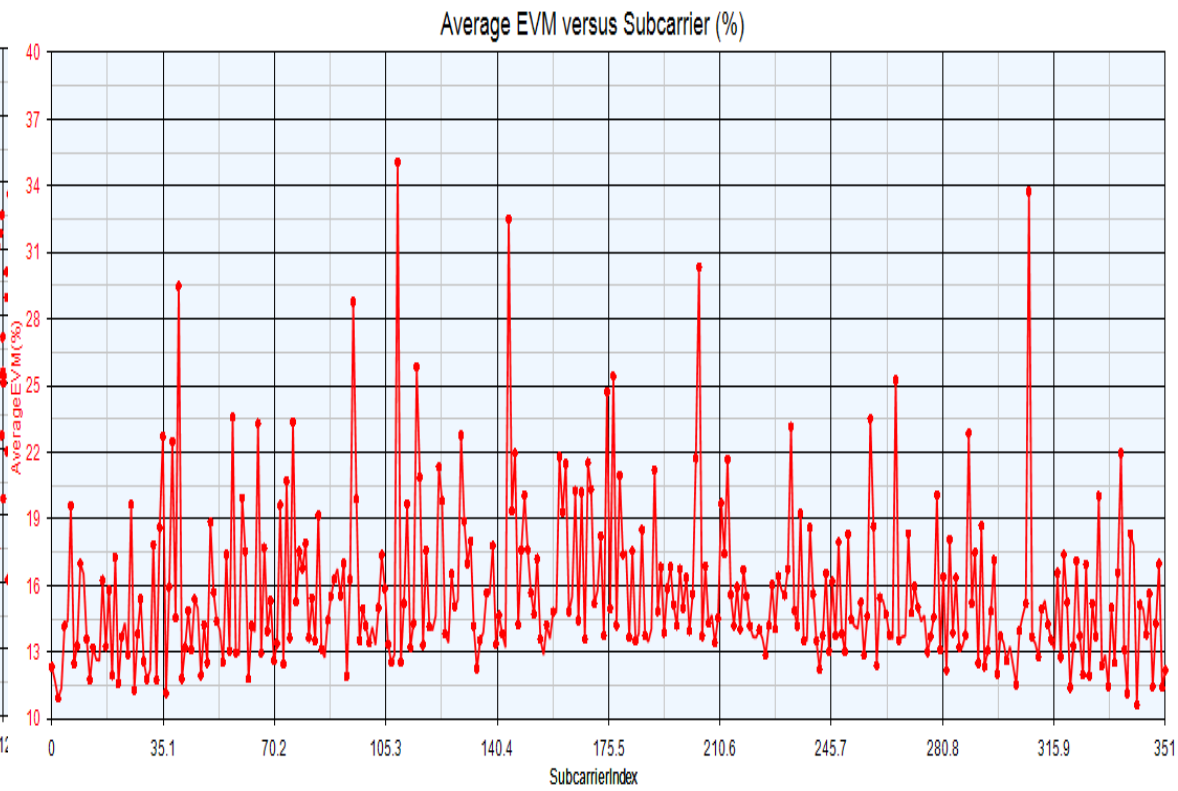




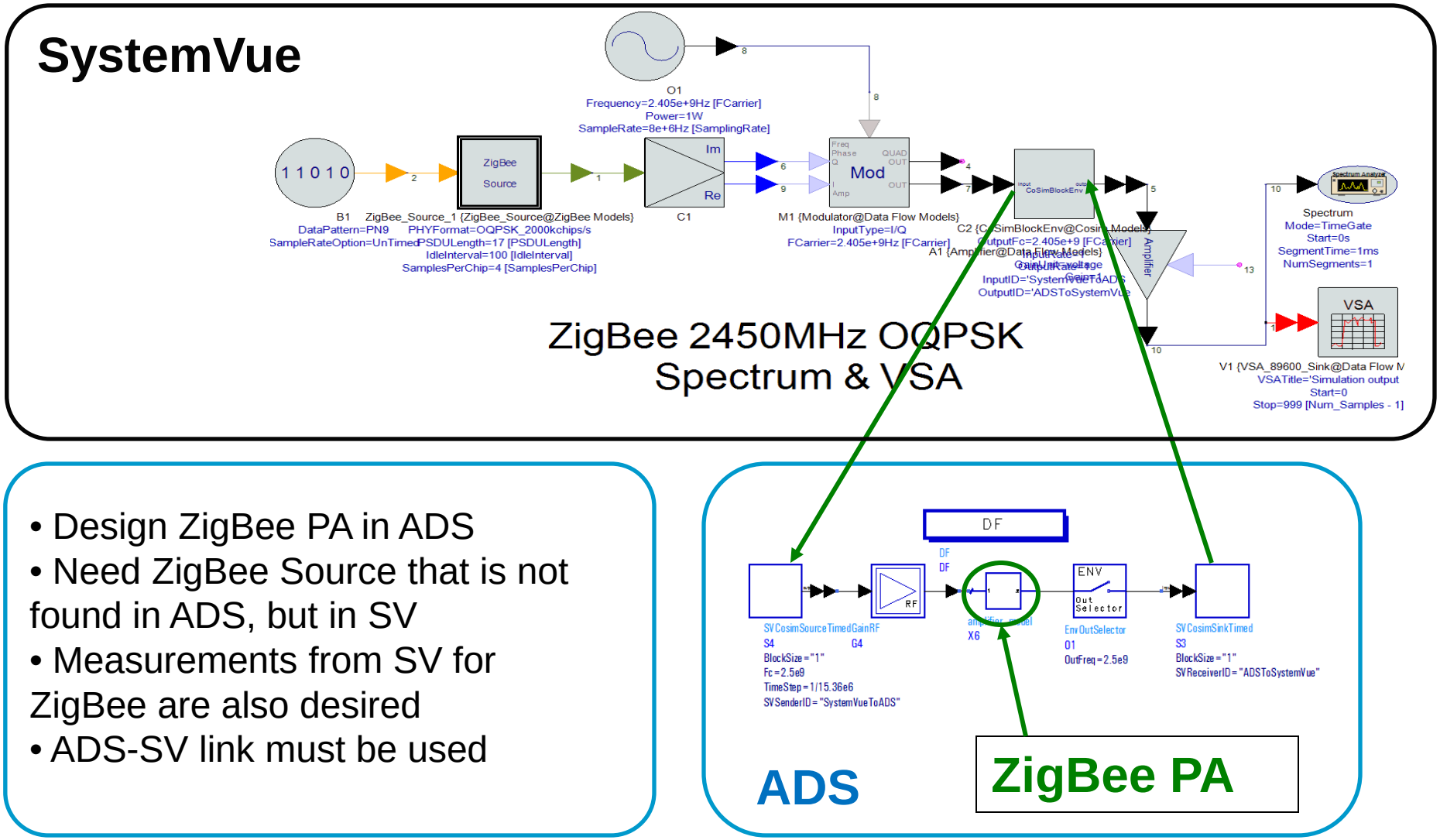
WPAN System Test Results

DUT - Nonlinear PA and reflection effects





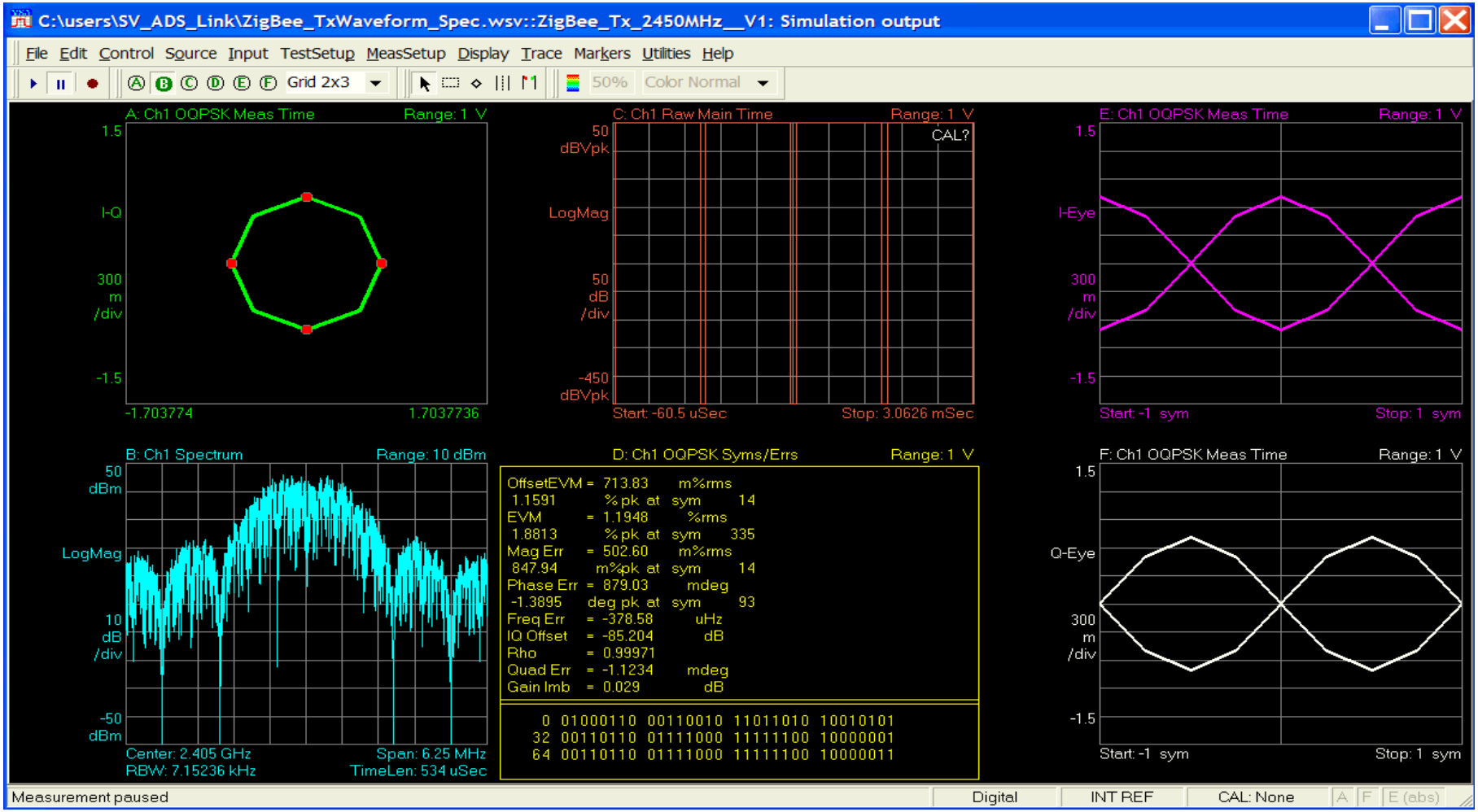
Example – ZigBee 2.450 GHz



- Design ZigBee PA in ADS
- Need ZigBee Source that is not found in ADS, but in SV
- Measurements from SV for ZigBee are also desired
- ADS-SV link must be used

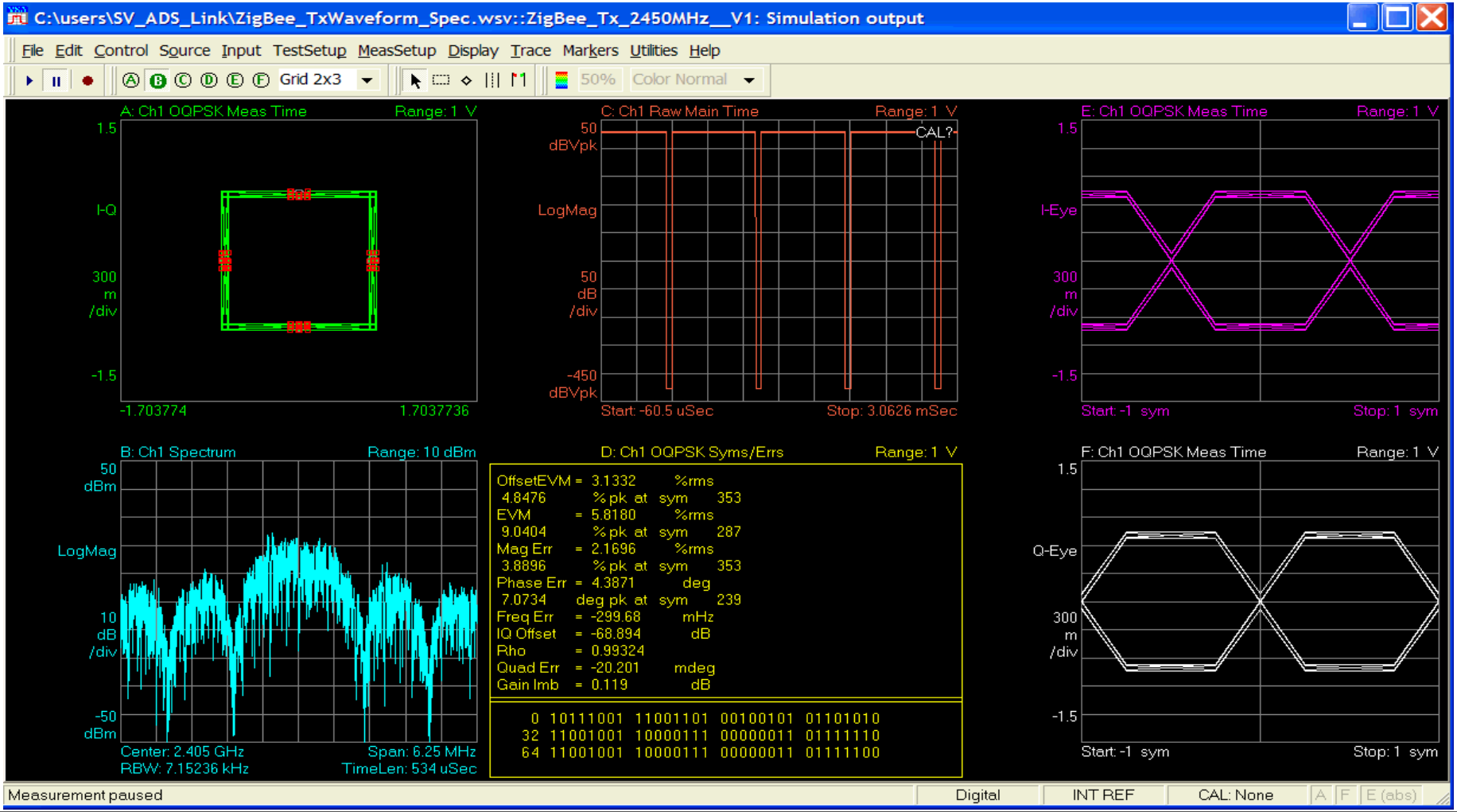
ZigBee System Test Results

ZigBee System with a linear power amplifier (TOI=)



ZigBee System Test Results

ZigBee System with a Nonlinear power amplifier (TOI=40)



ADS Ptolemy and SystemVue

Diagnose and fix problems in their native environment

ADS Ptolemy

"Verify-in-place" for RF component design

- Connected Verification – Virtualization of RF, BB, and H/W using co-simulation
- Enables certain kinds of mixed-signal design (PLL)

Re-uses many SystemVue components

SystemVue

"Verify-in-place" for System, Baseband DSP

- Accelerate RF-BB cross-domain Algorithm design
- Speaks enough RF to unite the domains
- Path to H/W prototyping
- Provides the latest Agilent-grade IP references
- Strongest connection to instruments

Strategic platform for Agilent

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